InfiniiVision 3000 X-Series Oscilloscopes

Data Sheet

Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

Agilent Technologies

Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

Breakthrough technology for budget conscious customers

Agilent Technologies is the fastest growing scope vendor in the market for good reason: we deploy our investments in technology to solve your measurement problems. This commitment to superior technology brings you the InfiniiVision X-Series oscilloscopes – engineered to deliver value, functionality and flexibility at prices that fit into your existing budgets. Whether you are looking for a basic entry-level oscilloscope or a more sophisticated model to get your job done, you want the most you can get for your money. The full line of InfiniiVision X-Series oscilloscopes – 26 models – ensure that you get exactly what you need today with room to grow in the future.

Overview of the Agilent InfiniiVision X-Series oscilloscopes

	InfiniiVision 2000 X-Series	InfiniiVision 3000 X-Series
Analog channels	2 and 4 analog channels	
Bandwidth (upgradable)	70, 100, 200 MHz	100, 200, 350, 500 MHz
Sample rate	1 GSa/s per channel 2 GSa/s half-channel interleaved mode	2 GSa/s per channel 4 GSa/s half-channel interleaved mode
Memory depth	100 kpts	2 Mpts standard, 4 Mpts optional (Option DSOX3MemUp)
Waveform update rate	50,000 waveforms per second	1,000,000 waveforms per second
Digital timing channels	8 on MSO models or with DSOX2MSO upgrade	16 on MSO models or with DSOX3MSO upgrade
WaveGen built-in 20 MHz function generator	Yes (Option DSOX2WAVEGEN)	Yes (Option DSOX3WAVEGEN)
Search and navigate	No	Yes
Serial protocol analysis	No	Yes (multiple options)
Segmented memory	Yes (Option DSOX2SGM)	Yes (Option DSOX3SGM)
Mask limit testing	Yes (Option DSOX2MASK)	Yes (Option DSOX3MASK)
AutoProbe interface	No	Yes

Need more memory or bandwidth?

See the InfiniiVision 7000B Series oscilloscopes

- 2 or 4 analog channels plus an optional 16 digital channels
- 100 MHz - 1 GHz bandwidth
- 8 Mpts memory (standard)
- Search and navigate capability
- Serial protocol analysis application available
- FPGA dynamic probe application available

See **www.agilent.com/find/7000** for more details

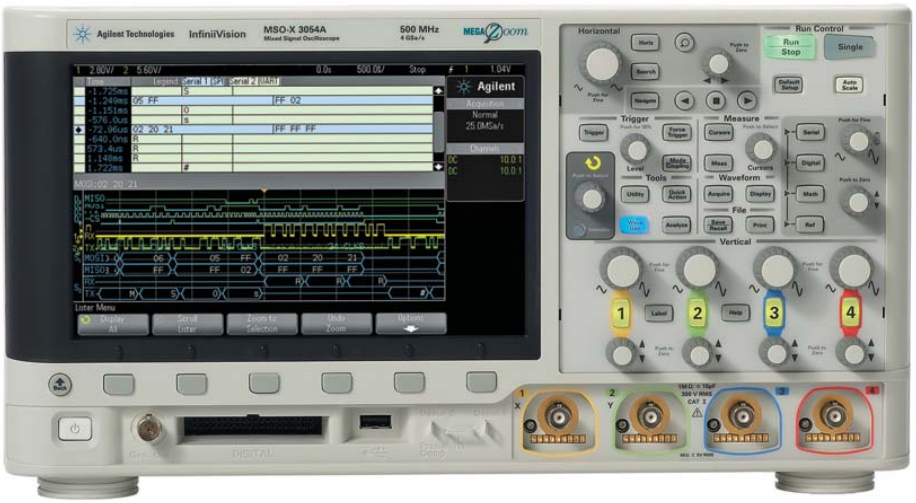
Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

More scope

The InfiniiVision 3000 X-Series offers entry-level price points to fit your budget with superior performance and optional capabilities that are not available in any other oscilloscope in its class. Our breakthrough technology delivers more scope for the same budget.

With more scope, you can:

- **See more** of your signal more of the time with the largest screen in its class, the deepest memory and the fastest waveform update rates
- **Do more** with the power of 4 instruments in 1: oscilloscope, logic timing analyzer, WaveGen built-in function generator (optional) and protocol analyzer (optional)
- **Get more** investment protection with the industry's only fully upgradable scope, including bandwidth



Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

See more of your signal, more of the time

Largest display

Engineering for the best signal visibility starts with the largest display. Our 8.5-inch WVGA display offers 50% more viewing area with 3.4 times the resolution (WVGA 800x480 versus WQVGA 480x234).

Fastest update rate

With Agilent-designed *MegaZoom* IV custom ASIC technology, the 3000 X-Series delivers up to 1 million waveforms per second. If an oscilloscope updates waveforms slowly, it can make using the oscilloscope very frustrating. Fast waveform update rates can improve oscilloscope display quality to show subtle waveform details such as noise and jitter with display intensity modulation. Most importantly, fast waveform update rates improve the probability of capturing random and infrequent events that would not be captured using an oscilloscope with a lower waveform update rate.

Notice that the Agilent 3000 X-Series allows you to see more of your signals, and captures the infrequent glitch and jitter that you are unable to see on other oscilloscopes in this class.

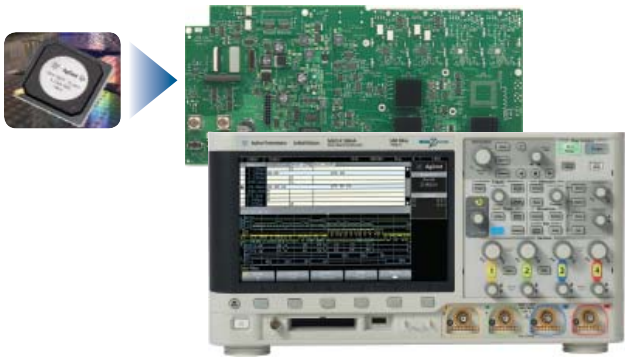
Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

See more of your signal, more of the time

Deeper memory for longer time capture

With up to 4 Mpts of *MegaZoom* IV deep memory, you can capture long, non-repeating signals while maintaining a high sample rate, then quickly zoom in on areas of interest. The InfiniiVision X-Series optimizes your deep memory oscilloscope measurements by using *MegaZoom* IV technology to make the most effective trade-offs in sample rate, memory depth and waveform update rate. Although you may think deeper memory is always better, using deep memory means making tradeoffs for many other scopes on the market today. Scopes with deep memory are typically priced higher, and require additional waveform processing time to acquire deep memory waveforms. This typically means waveform update rates will be reduced, sometimes significantly. For this reason, most other scopes have manual memory-depth selections, and the typical default memory depth setting is usually relatively shallow (10 to 100 kpts). If you want to use deep memory in these other scopes, you must manually turn it on and deal with the update rate tradeoff. So you have to know when it is important to use deep memory and when it is not. Agilent's exclusive *MegaZoom* IV technology automatically selects deeper memory when needed in order to maintain fast sample rates while also updating fast.

How does Agilent do that?



Agilent-designed *MegaZoom* IV custom ASIC technology combines the capabilities of an oscilloscope, logic analyzer, protocol analyzer, and WaveGen built-in function generator in a compact form factor at an affordable price. 4th generation *MegaZoom* technology enables the industry's fastest waveform update rate with responsive deep memory acquisitions.

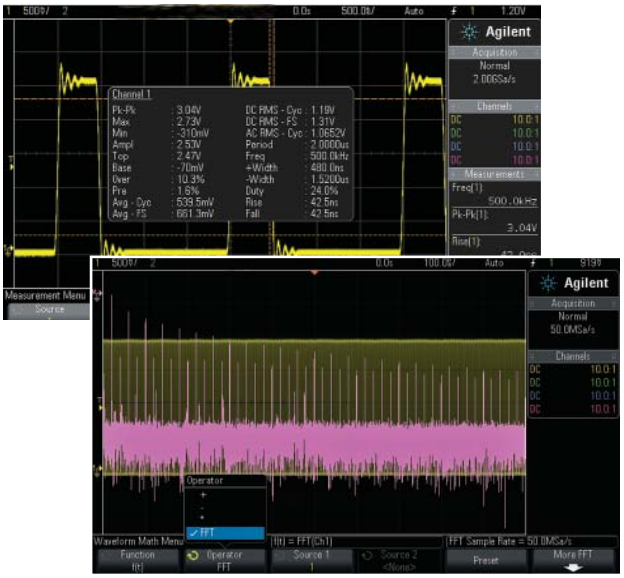
Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

Do more with the power of 4 instruments in 1

Best-in-class oscilloscope

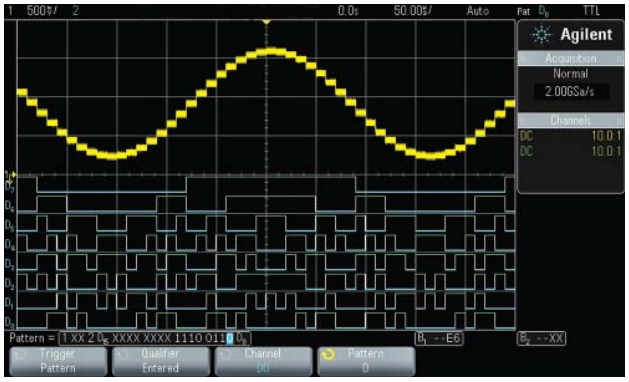
The InfiniiVision 3000 X-Series features the deepest memory in its class with up to 4 Mpts of Agilent's patented *MegaZoom* IV technology that is always enabled and always responsive providing the industry's fastest update rate at up to 1 million waveforms per second, with no compromise if you turn on measurements or add digital channels.

In addition, the 3000 X-Series offers 33 automated measurements, nine parametric triggers, six serial protocol triggers, as well as seven waveform math functions including FFT. All of this at a comparable price to the Tektronix DPO2000 oscilloscope.



Industry's only upgradable, integrated mixed signal oscilloscope (MSO)

The 3000 X-Series is the first instrument in its class to offer an integrated and upgradable logic timing analyzer. Digital content is everywhere in today's designs and traditional 2 and 4 channel oscilloscopes do not always provide enough channels for the job at hand. With an additional 16 integrated digital timing channels, you now have up to 20 channels of time-correlated triggering, acquisition and viewing on the same instrument. Buy a 2 or 4 channel DSO and at anytime, upgrade it yourself to an MSO with a license to turn on those integrated 16 digital timing channels.

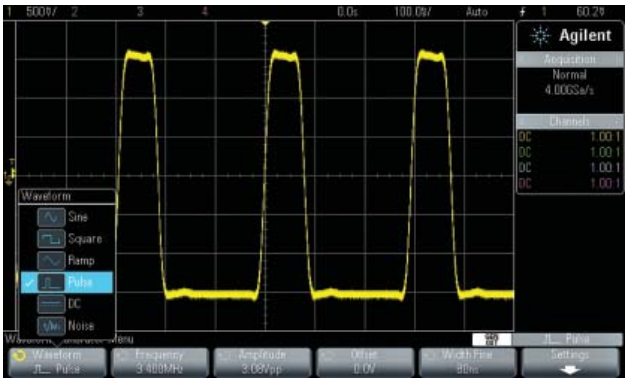


Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

Do more with the power of 4 instruments in 1

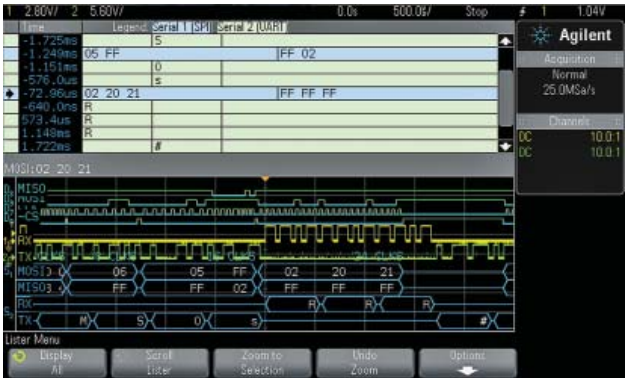
Industry-exclusive WaveGen built-in function generator

An industry first, the 3000 X-Series offers an integrated 20 MHz function generator. Ideal for educational or design labs where bench space and budget are at a premium, the integrated function generator provides stimulus output of sine, square, ramp, pulse, DC, and noise waveforms to your device under test. No need to buy a separate function generator when you can get one integrated in your new oscilloscope. Turn on WaveGen at any time by ordering the DSOXWaveGen option and install the license yourself.



Hardware-based serial protocol decode and triggering

- Embedded serial triggering and analysis (I^2C, SPI)
- Computer serial triggering and analysis (RS232/422/485/UART)
- Automotive and industrial serial triggering and analysis (CAN,LIN
- Audio serial triggering and analysis (I^2S)



Agilent's InfiniiVision Series oscilloscopes are the industry's only scopes to use hardware-based serial protocol decoding. Other vendors scopes use software post-processing techniques to decode serial packets/frames. With these software techniques, waveform and decode-update rates tend to be slow (sometimes seconds per update). That's especially true when using deep memory, which is often required to capture multiple packetized serial bus signals. And when analyzing multiple serial buses simultaneously, decode update rates can be even slower. Faster decoding with hardware-based technology enhances scope usability, and more importantly, the probability of capturing infrequent serial communication errors. After capturing a long record of serial bus communication using the InfiniiVision scope's *MegaZoom* IV deep memory, you can easily perform a search operation based on specific criteria, and then quickly navigate to bytes/frames of serial data that satisfy that search criteria. Sometimes it may be necessary to correlate data from one serial bus to another. Agilent's InfiniiVision 3000 X-Series oscilloscope can decode two serial buses simultaneously using hardware-based decoding. Plus it is the only scope on the market that can also display the captured data in a time-interleaved "Lister" display.

Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

Get more investment protection with the industry's only fully upgradable oscilloscope

Upgradability:

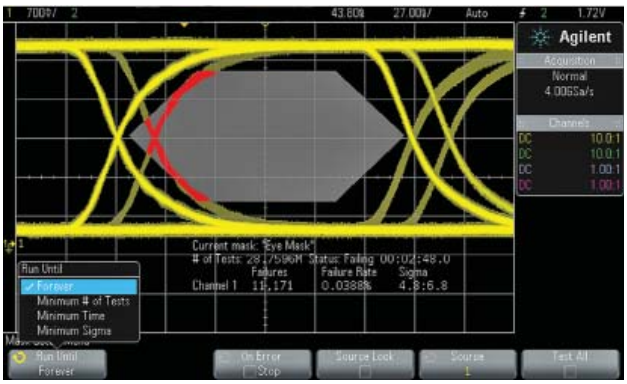
Project needs change, but traditional oscilloscopes are fixed – you get what you pay for at the time of purchase. With the 3000 X-Series, your investment is protected. If you need more bandwidth (up to 500 MHz), digital channels, WaveGen or measurement applications in the future, you can easily add them all after the fact.

Add at the time of your purchase or upgrade later:

- Bandwidth
- Digital channels (MSO)
- WaveGen
- Measurement applications
  - Serial protocol analysis
  - Mask testing
  - Segmented memory
  - Educators' lab kit

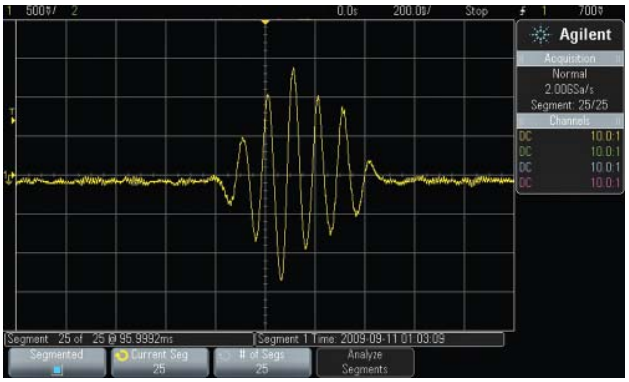
Mask testing

Whether performing pass/fail tests to specified standards in manufacturing or testing for infrequent signal anomalies in R&D debug, the mask test option can be a valuable productivity tool. The 3000 X-Series features the industry's only hardware-based mask testing and can perform up to 280,000 tests per second.



Segmented memory

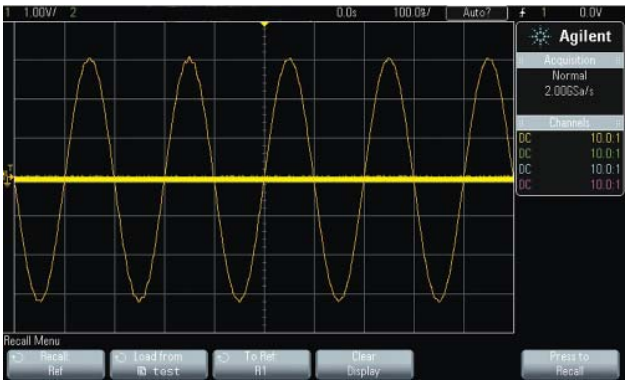
When capturing low-duty cycle pulses or data bursts, you can use segmented memory acquisition to optimize acquisition memory. Segmented memory acquisition lets you selectively capture and store important segments of signals without capturing unimportant signal idle/dead-time. Segmented memory acquisition is ideal for applications including packetized serial buses, pulsed laser, radar bursts and high-energy physics experiments. Up to 1000 segments can be captured on the 3000 X-Series models with a minimum re-arm time under 1 µs.



Other productivity tools

Reference waveforms

Store up to two waveforms in the scope's non-volatile reference waveform memory locations. Compare these reference waveforms with live waveforms, and perform post analysis and measurements on stored data. You can also store waveforms on a removable USB memory device in *.h5 format and recall them back into scope's reference waveform memory later. Save and/or transfer waveforms to a PC as XY data pairs in a comma-separated values format (*.csv) or store bitmap images and transfer them to a PC for documentation purposes in a variety of image formats including: 8-bit bitmaps (*.bmp), 24-bit bitmaps (*.bmp), and PNG 24-bit images (*.png).



Localized GUI and help

Operate the scope in the language most familiar to you. The graphical user interface, built-in help system, front panel overlays, and user's manual are available in 11 languages. Choose from: English, Japanese, simplified Chinese, traditional Chinese, Korean, German, French, Spanish, Russian, Portuguese and Italian. During operation, access the built-in help system just by pressing and holding any button.

Probe solutions and compatibility

Get the most out of your 3000 X-Series scope, by using the right probes and accessories for your application. Agilent offers a complete family of innovative probes and accessories for the InfiniiVision 3000 X-Series scopes. For the most up-to-date and complete information about Agilent's probes and accessories, visit our Web site at www.agilent.com/find/scope_probes.

Also available is the N2744A T2A (Tektronix TekProbe® interface to Agilent AutoProbe) probe interface adapter. This adapter allows users of Tektronix TekProbe active probes to connect directly to the InfiniiVision 3000 X-Series AutoProbe interface BNC input. Protect your previous probe investment while taking advantage to the InfiniiVision 3000 X-Series' unique capabilities and value.

Other productivity tools

Autoscale

Quickly display any active signals and automatically set the vertical, horizontal and trigger controls for optimal viewing with the press of the autoscale button. (This feature can be disabled or enabled for the education environment).

Connectivity

Built-in USB host (on front, one back) and USB device ports make PC connectivity easy. Operate the scope from your PC and save and recall stored waveforms as well as set-up files via LAN. An optional LAN/VGA module gives you network connectivity if you need it as well as the ability to connect to an external monitor. An optional GPIB module is also available. Only one module may be used at a time.

Keep accessories with the scope

A built-in storage compartment allows you to easily keep your probes, power cords and other accessories with the oscilloscope.

Designed with research and development in mind

Find more glitches and infrequent events quickly

Debugging and fixing designs is one of the most important tasks of R&D engineers so that they can ship reliable products to their customers. Finding the infrequent and random circuit problem is often like looking for a needle in a haystack. In addition to fast waveform updates, which improve a scope's probability of capturing infrequent anomalies, it is often necessary to search waveform records and/or trigger on specific pulse parametric violation conditions. Agilent's InfiniiVision 3000 X-Series oscilloscope provide the most comprehensive set of Search & Navigation capabilities, as well as the most advanced set of pulse parameter triggering selections of any oscilloscope in its class.

Search and Navigation

When capturing long complex waveforms using the scope's deep acquisition memory, manually scrolling through stored waveform data to find specific events of interest can be slow and cumbersome. But with the InfiniiVision 3000 X-Series scope's automatic Search & Navigation capability, you can easily set up specific search criteria and then quickly navigate to "found and marked" events using the scope's front panel forward and back navigation keys. Available search criteria include: Edges, Pulse Width (time-qualified), Rise/Fall Times (time-qualified), Runt Pulses (time- and level-qualified), and Serial.

In the example shown in the screen image on the right, the scope was set up to capture a 1 millisecond time-span of a complex digital data stream. Using the scope's Search & Navigation capability, the scope was able to find, mark (white triangles shows location of each runt), and then quickly navigate to 20 occurrences of "runt" pulses.

Advanced Parametric and Serial Bus Triggering

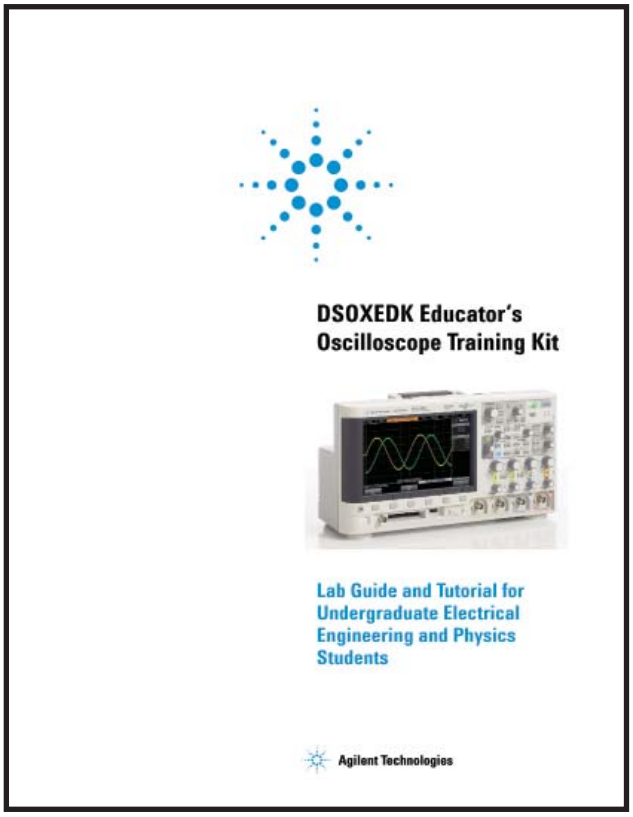
With today's more complex signals, it is also often necessary to trigger on complex signal conditions in order to synchronize the scope's acquisition on specific events of interest. Agilent's InfiniiVision 3000 X-Series scopes can trigger on the following conditions: Edge, Pulse Width (time-qualified), Pattern, Rise/Fall Time, Nth Edge Burst, Runt, Setup & Hold, Video, USB, Serial1, and Serial2.

Designed with education in mind

Quickly and easily set up or upgrade a teaching lab

Teach your students what an oscilloscope is and how to perform basic measurements with the Educator's Oscilloscope Training Kit (DSOXEDK). It includes training tools created specifically for electrical engineering and physics undergraduate students and professors. It contains an array of built-in training signals, a comprehensive oscilloscope lab guide and tutorial written specifically for the undergraduate student and an oscilloscope fundamentals PowerPoint slide set for professors and lab assistants. For more information, refer to www.agilent.com/find/EDK. Also available are DreamCatcher's full-semester, application-specific courseware written around Agilent test and measurement equipment: www.dreamcatcher.asia/cw.

Get your students to quickly put the scope to work



Intuitive localized front panel design with pushable knobs for quick access to commonly used oscilloscope functions, help students spend more time learning the concepts and less time learning how to use the oscilloscope. Enable your students to answer their own questions with the localized built-in help system that provides quick access by simply pressing and holding any button.

Stretch your budget over the long term

Save money with an industry-exclusive built-in 20 MHz WaveGen instead of buying a separate function generator. Buy what you need today and protect your investment in the future with the only oscilloscopes in this class with upgradable bandwidth, 16 digital channels (MSO), upgradable WaveGen and measurement applications. Get a long scope life and keep repair costs to a minimum with a standard 3-year warranty and an instrument reliability you've come to expect from the leader in test and measurement equipment.

Optimize lab bench space

With 4 instruments in 1, you will save on precious lab bench space by getting an oscilloscope, logic timing analyzer, protocol analyzer, and WaveGen function generator all in one innovative instrument with a footprint that is only 5.57 inches deep. With the large 8.5-inch WVGA display, you can easily view all signals on one screen with enough viewing area for more than one student to view.

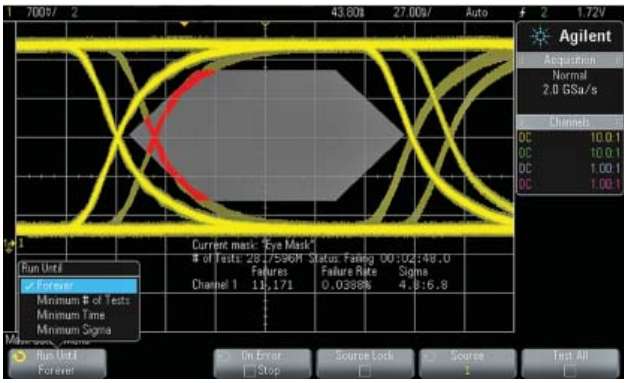
Designed with manufacturing in mind

Stretch a limited budget

Project needs change, but traditional oscilloscopes are fixed – you get what you pay for at time of purchase. With the 3000 X-Series, your investment is protected. If you need more bandwidth (up to 500 MHz) or measurement applications like mask testing in the future, you can easily add them all when you need it.

Get your technicians to quickly put the scope to work

Intuitive localized front panel design and pushable knobs for quick access to commonly used oscilloscope functions, allow technicians to spend more time testing and less time learning where the menus are on the oscilloscope. Enable your technicians to answer their own questions with the localized built-in help system that provides quick access by simply pressing and holding any button.



Faster, low failed device escape test throughput

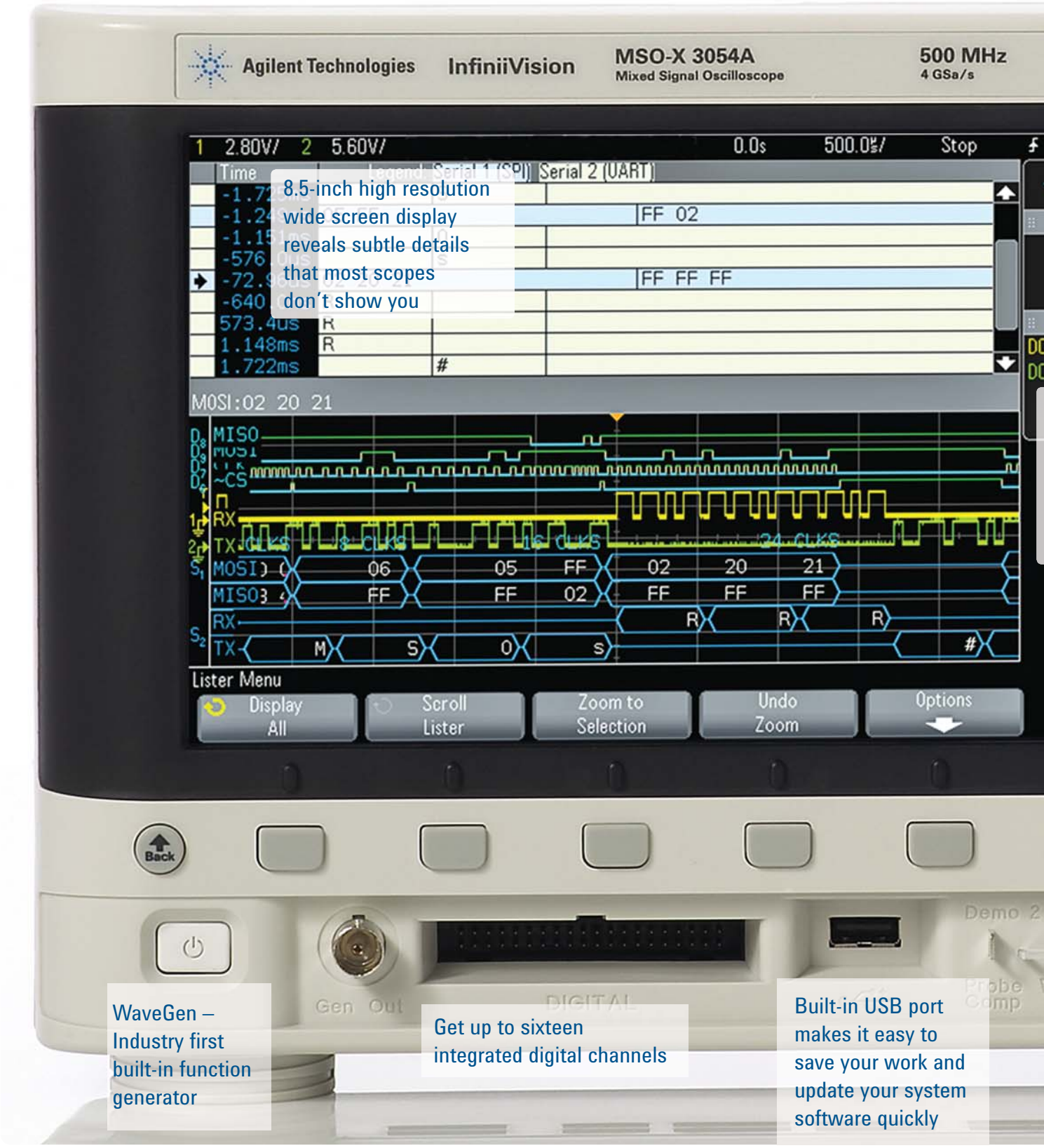
With the fastest architecture in its class, featuring up to 1,000,000 waveforms/sec, you will capture more of those elusive problems you worry about and ensure they don't ship to customers. With the mask limit testing measurement application, you can quickly test up to 280,000 waveforms per second to a known good waveform with a quick go/no-go test results, saving you valuable test time while having more certainty.

Optimize test bench space

With 4 instruments in 1, you will save on precious line bench space by getting an oscilloscope, logic timing analyzer, protocol analyzer, and WaveGen function generator all in one innovative instrument with a footprint that is only 5.57 inches deep. With the large 8.5-inch WVGA display, you can easily view all signals on one screen even when the scope is sitting far away from the operator.

Oscilloscopes redefined: Breakthrough technology delivers more scope for the same budget

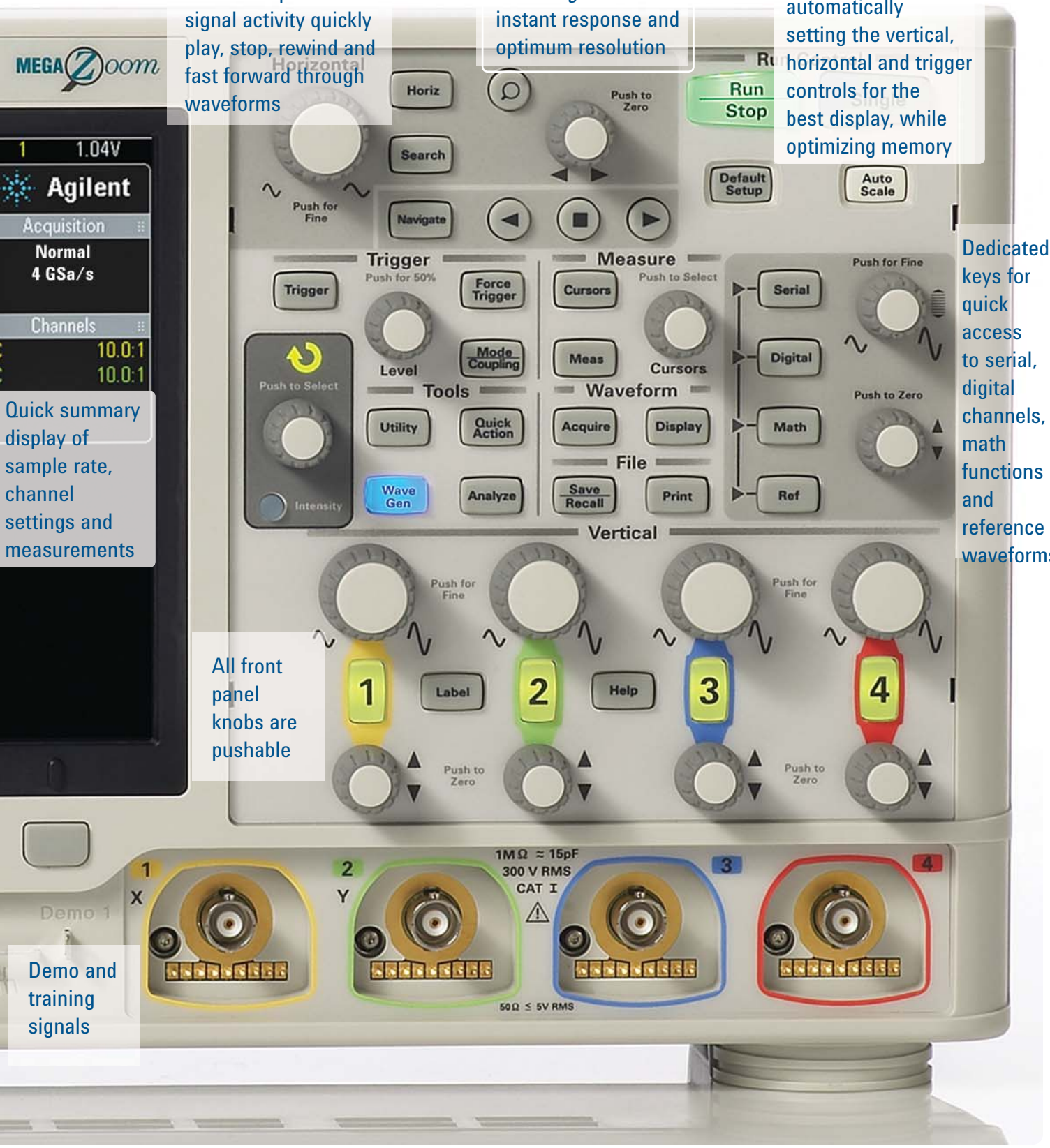
Oscilloscope shown actual size


Agilent Technologies
InfiniiVision
MSO-X 3054A
Mixed Signal Oscilloscope
500 MHz
4 GSa/s
8.5-inch high resolution wide screen display reveals subtle details that most scopes don't show you
Lister Menu
Display All
Scroll Lister
Zoom to Selection
Undo Zoom
Options
Back
WaveGen – Industry first built-in function generator
Get up to sixteen integrated digital channels
Built-in USB port makes it easy to save your work and update your system software quickly

Search and Navigate front panel controls make it easy to find and view specific signal activity quickly play, stop, rewind and fast forward through waveforms

Quickly pan and zoom for analysis with *MegaZoom* IV's instant response and optimum resolution

Autoscale lets you quickly display any analog or digital active signals, automatically setting the vertical, horizontal and trigger controls for the best display, while optimizing memory



Quick summary display of sample rate, channel settings and measurements

All front panel knobs are pushable

Dedicated keys for quick access to serial, digital channels, math functions and reference waveforms

Demo and training signals

Configuring your InfiniiVision X-Series oscilloscope

Step 1.

Choose your bandwidth, number of channels and memory depth.

InfiniiVision 3000 X-Series scopes	DSOX3012A MSOX3012A	DSOX3014A MSOX3014A	DSOX3024A MSOX3024A	DSOX3032A MSOX3032A	DSOX3034A MSOX3034A	DSOX3052A MSOX3052A	DSOX3054A MSOX3054A
Bandwidth (upgradable)	100 MHz	100 MHz	200 MHz	350 MHz	350 MHz	500 MHz	500 MHz
Analog channels	2	4	4	2	4	2	4
Digital channels (MSO)	16 integrated digital channels (optional)						
Memory	2 Mpts half-channel standard, or 4 Mpts half-channel (DSOX3MEMUP)						

Step 2.

Tailor your scope with measurement applications to save time and money.

Application	3000 X-Series
WaveGen (built-in function generator)	DSOX3WAVEGEN
Educator's kit	DSOXEDK
Mask testing	DSOX3MASK
Segmented memory	DSOX3SGM
Embedded serial triggering and analysis (I^2C, SPI)	DSOX3EMBD
Computer serial triggering and analysis (RS232/422/485/UART)	DSOX3COMP
Automotive serial triggering and analysis (CAN, LIN)	DSOX3AUTO
Audio serial triggering and analysis (I^2S)	DSOX3AUDIO
Power measurement and analysis	U1881A
PC offline viewing	B4610A

Step 3.

Choose your probes.

Probes	3000 X-Series
N2862B Passive probe 150 MHz 10:1 attenuation	1 per channel included 100 MHz models
N2863B Passive probe 300 MHz, 10:1 attenuation	1 per channel included 200 MHz models
N2890A Passive probe 500 MHz, 10:1 attenuation	1 per channel included 350/500 MHz models
N6450-60001 16 digital channel MSO cable	1 per scope included on all MSO models and DSOX3MSO upgrades
N2889A passive probe 350 MHz 10:1/1:1 switchable attenuation	Optional
10076B passive probe 250 MHz 100:1 attenuation	Optional
N2771B passive probe 50 MHz 1000:1 attenuation	Optional
N2795A single-ended active probe 1 GHz ±8 V with AutoProbe interface	Optional
N2790A differential active probe 100 MHz ±1.4 kV with AutoProbe interface	Optional
N2792A differential active probe 200 MHz ±20 V	Optional
N2793A differential active probe 800 MHz ±15 V	Optional
1146A AC/DC current probe 100 kHz 100 A	Optional
1147A AC/DC current probe 50 MHz 15 A with AutoProbe interface	Optional
N2893A AC/DC current probe 100 MHz 15 A with AutoProbe interface	Optional

Step 4.

Add the final touches.

Recommended accessories	3000 X-Series
LAN/VGA connection module	DSOXLAN
GPIB connection module	DSOXGPIB
Rack mount kit	N6456A
Soft carrying case and front panel cover	N6457A
Hard copy manual	N6458A

Performance characteristics

DSOX3000 Series (digital signal oscilloscope) MSOX3000 Series (mixed signal oscilloscope)							
	DSOX3012A MSOX3012A	DSOX3014A MSOX3014A	DSOX3024A MSOX3024A	DSOX3032A MSOX3032A	DSOX3034A MSOX3034A	DSOX3052A MSOX3052A	DSOX3054A MSOX3054A
Characteristics							
Analog bandwidth* (-3dB)	100 MHz	100 MHz	200 MHz	350 MHz	350 MHz	500 MHz	500 MHz
Analog input channels	2	4	4	2	4	2	4
Calculated rise time	≤ 3.5 ns	≤ 3.5 ns	≤ 1.75 ns	≤ 1 ns	≤ 1 ns	≤ 800 ps	≤ 800 ps

	All 3000 X-Series models
Hardware bandwidth limits	20 MHz selectable
Input coupling	AC, DC, GND
Input impedance	Selectable: 1 MΩ ± 1%; 50 Ω ± 1.5%
Input sensitivity range	2 mV/div to 5 V/div**
Sample rate on each channel	2 GSa/s per channel, 4 GSa/s interleaved
Memory depth (record length)	Up to 4 Mpts
Display	8.5-inch WVGA with 64 levels of intensity grading
Waveform update rate (max)	1,000,000 waveforms/s
Vertical resolution	8 bits
Horizontal resolution	2.5 ps
Maximum input voltage	CAT I 300 Vrms, 400 Vpk; transient overvoltage 1.6 kVpk CAT II 300 Vrms, 400 Vpk With 10073C 10:1 probe: CAT I 500 Vpk, CAT II 400 Vpk With N2862A or N2863A 10:1 probe: 300 Vrms
DC vertical accuracy	±[DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale] **
DC gain accuracy*	±2% full scale**
Channel-to-channel isolation	> 100:1 from DC to maximum specified bandwidth of each model (measured with same V/div and coupling on channels)
Offset range	±2 V (2 mV/div to 200 mV/div) ±50 V (> 200 mV/div to 5 V/div)
DC vertical offset accuracy	±0.1div ± 2mV ± 1% of offset setting

* Denotes warranted specifications, all others are typical.
Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.
** 2 mV/div is a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 32 mV for 2 mV/div sensitivity setting.

Performance characteristics

Vertical system digital channels

	All MSO 3000 X-Series models and on all DSO 3000 X-Series models with after purchase upgrade
Characteristics	
Digital input channels	16 digital (D0 to D15)
Thresholds	Threshold per set of 8 channels
Threshold selections	TTL (+1.4 V) 5 V CMOS (+2.5 V) ECL (–1.3 V) User-definable (selectable by pod)
User-defined threshold range	±8.0 V in 10 mV steps
Maximum input voltage	±40 V peak CAT I; transient overvoltage 800 Vpk
Threshold accuracy*	±(100 mV + 3% of threshold setting)
Maximum input dynamic range	±10 V about threshold
Minimum voltage swing	500 mVpp
Input impedance	100 kΩ ±2% at probe tip
Probe loading	~8 pF
Vertical resolution	1 bit

Horizontal system analog channels

	All 3000 X-Series models
Characteristics	
Maximum sample rate	2 GSa/sec, 4 GSa/s half-channel interleaved
Maximum record length	2 Mpts per channel, 4 Mpts half-channel interleaved
Maximum duration of time captured at highest sample rate (all channels)	1 ms

	DSOX3012A MSOX3012A	DSOX3014A MSOX3014A	DSOX3024A MSOX3024A	DSOX3032A MSOX3032A	DSOX3034A MSOX3034A	DSOX3052A MSOX3052A	DSOX3054A MSOX3054A
Time base range (s/div)	5 ns/div to 50 s/div	5 ns/div to 50 s/div	2 ns/div to 50 s/div	2 ns/div to 50 s/div	2 ns/div to 50 s/div	1 ns/div to 50 s/div	1 ns/div to 50 s/div

	All 3000 X-Series models
Time base delay time range	Pre-trigger – Greater of 1 screen width or 200 µs Post-trigger – 1 s to 500 s
Channel-to-channel deskew range	± 100 ns
Time base accuracy*	25 ppm ± 5 ppm per year (aging)
Δ Time accuracy (using cursors)	±(timebase acc. x reading) ± (0.0016 x screen width) ± 100 ps
Modes	Main, zoom, roll, XY
XY	On channels 1 and 2 only Z Blanking on Ext Trigger Input, 1.4 V threshold Bandwidth: Maximum bandwidth Phase error at 1 MHz: < 0.5 degree

* Denotes warranted specifications, all others are typical.
Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

Performance characteristics

Horizontal system digital channels

	All MSO models and DSO models with MSO upgrade
Characteristics	
Maximum sample rate	1 GSa/s
Maximum record length	2 Mpts (digital only), 500 kpts (analog and digital channels)
Minimum detectable pulse width	5 ns
Channel-to-channel skew	2 ns (typical); 3 ns (maximum)

Trigger system

	All 3000 X-Series models
Characteristics	
Trigger modes	• Normal (triggered): requires trigger event for scope to trigger • Auto: triggers automatically in absence of trigger event • Single: triggers only once on a trigger event, press **[Single]** again for scope to find another trigger event, or press **[Run]** to trigger continuously in either Auto or Normal mode • Force: front panel button that forces a trigger
Trigger coupling	DC: DC coupled trigger AC: AC coupled trigger, cutoff frequency: < 10 Hz (internal); <50 Hz (external) HF Reject: High frequency reject, cutoff frequency ~ 50 kHz LF Reject: Low frequency reject, cutoff frequency ~ 50 kHz Noise Reject: Selectable OFF or ON, decreases sensitivity 2x
Trigger holdoff range	40 ns to 10.00 s
Trigger sentivity	
Internal*	<10 mV/div: greater of 1 div or 5 mV; ≥ 10 mV/div: 0.6 div
External*	200 mVpp from DC to 100 MHz 350 mVpp 100 MHz to 200 MHz
Trigger level range	
Any channel	± 6 div from center screen
External	± 8 V

* Denotes warranted specifications, all others are typical.
Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

Performance characteristics

Trigger type selections	
	All 3000 X-Series models
Characteristics	
Edge	Trigger on a rising, falling, alternating or either edge of any source
Pulse width	Trigger on a pulse on a selected channel, whose time duration is less than a value, greater than a value, or inside a time range • Minimum duration setting: 2 ns- 10 ns (depends on bandwidth) • Maximum duration setting: 10 s
Runt	Trigger on a position runt pulse that fails to exceed a high level threshold. Trigger on a negative runt pulse that fails to exceed a low level threshold. Trigger on either polarity runt pulse based on two threshold settings. Runt triggering can also be time-qualified (< or >) with a minimum time setting of 4 ns and maximum timesetting of 10 s.
Setup and hold	Trigger and clock/data setup and/or hold time violation from < 0.0 to 10 s
Rise/fall time	Trigger on rise time or fall time edge speed violations (< or >) based on user-selectable threshold. Time settings range from (< or >) or 2 ns to 10 s.
N^{th} edge bust	Trigger on the N^{th} edge of a burst that occurs after a specified idle time.
Pattern	Trigger when a specified pattern of high, low, and don't care levels on any combination of analog, digital , or trigger channels is [entered | exited]. Pattern must have stabilized for a minimum of 2 ns to qualify as a valid trigger condition.
Time-qualified pattern	Trigger on a multi-channel pattern whose time duration is less than a value, greater than a value, greater than a time value with a timeout, or inside or outside of a set of time values. • Minimum duration setting: 2 ns - 10 ns (depends on bandwidth) • Maximum duration setting: 10 s
Video	Video – Trigger on all lines or individual lines, odd/even or all fields from composite video, or broadcast standards (NTSC, PAL, SECAM, PAM-M)
USB	Trigger on start of packet, end of packet, reset complete, enter suspend, or exit suspend. Support USB low-speed and full-speed.
I^2S (optional)	Trigger on 2's complement data of audio left channel or right channel (=, ≠, <, >, > <, < >, increasing value, or decreasing value)
I^2C (optional)	Trigger on I^2C (Inter-IC bus) serial protocol at a start/stop condition or user defined frame with address and/or data values. Also trigger on missing acknowledge, address with no accq, restart, EEPROM read, and 10-bit write.
SPI (optional)	Trigger on SPI (Serial Protocol Interface) data pattern during a specific framing period. Supports positive and negative Chip Select framing as well as clock Idle framing and user-specified number of bits per frame.
CAN (optional)	Trigger on CAN (controller area network) version 2.0A and 2.0B signals. Trigger on the start of frame (SOF) bit (standard). Remote frame ID (RTR), data frame ID (~RTR), remote or data frame ID, data frame ID and data, error frame, all errors, acknowledge error and overload frame.
LIN (optional)	Trigger on LIN (Local Interconnect Network) sync break, sync frame ID, or frame ID and data.
RS-232/422/485/UART (optional)	Trigger on Rx or Tx start bit, stop bit or data content

Performance characteristics

Acquisition modes

	All 3000 X-Series models
Characteristics	
Normal	
Peak detect	Capture glitches as narrow as 250-ps at all timebase settings
Averaging	Selectable from 2, 4, 8, 16, 64, ... to 65,536
High Resolution Mode	12 bits of resolution when ≥10 µs/div at 4 GSa/s or ≥20-µs/div at 2 GSa/s
Segmented (optional)	Re-arm time = 1 µs (minimum time between trigger events)

Waveform measurements

	All 3000 X-Series models
Characteristics	
Cursors**	• Single cursor accuracy: +[DC vertical gain accuracy + DC vertical offset accuracy + 0.25% full scale] • Dual cursor accuracy: +[DC vertical gain accuracy + 0.5% full scale]*
Automatic measurements	Measurements continuously updated with statistics. Cursors track last selected measurement. Select up to four measurements from the list below: • Voltage: peak-to-peak, maximum, minimum, amplitude, top, base, overshoot, pre-shoot, average- N cycles, average- full screen, DC RMS- N cycles, DC RMS- full screen, AC RMS- N cycles, AC RMS- full screen (standard deviation), ratio (RMS1/RMS2) • Time: period, frequency, counter, + width, - width, burst width, duty cycle, rise time, fall time, delay, phase, X at min Y, X at Max Y • Count: positive pulse count, negative pulse count, rising edge count, falling edge count • Mixed: area- N cycles, area- full screen
Counter	Built-in frequency counter: • Source: on any analog or digital channel • Resolution: 5 digits • Maximum frequency: bandwidth of scope

Waveform math

	All 3000 X-Series models
Characteristics	
Arithmetic	f (g(t)) g(t): { 1, 2, 3, 4, 1-2, 1+2, 1x2, 3-4, 3+4, 3x4} f(t): { 1-2, 1+2, 1x2, 3-4, 3+4, 3x4, FFT(g(t)), differentiate d/dt g(t), integrate $\int$ g(t) dt, square root $\sqrt{}$g(t) } Where 1,2,3,4 represent analog input channels 1, 2, 3, and 4 Note: Channels 3 and 4 only available on MSO/DSOX3xx4A models
FFT	Up to 64 kpts resolution Set FFT Window to: Hanning, Flat Top, Rectangular, Blackman-Harris

* Denotes warranted specifications, all others are typical.
Specifications are valid after a 30-minute warm-up period and ±10 °C from firmware calibration temperature.

** 2 mV/div is a magnification of 4 mV/div setting. For vertical accuracy calculations, use full scale of 32 mV for 2 mV/div sensitivity setting.

Performance characteristics

Display characteristics

	All 3000 X-Series models
Characteristics	
Display	8.5-inch WVGA
Resolution	800 (H) x 480 (V) pixel format (screen area)
Graticules	8 vertical divisions by 10 horizontal divisions with intensity controls.
Format	YT and XY
Maximum waveform update rate	> 1,000,000 wfms/s
Persistence	Off, infinite, variable persistence (100 ms - 60 s)
Intensity gradation	64 intensity levels

Input/output ports

	All 3000 X-Series models
Port	
USB 2.0 hi-speed host port	Two USB 2.0 hi-speed host ports, front and real panel Supports memory devices and printers
USB 2.0 hi-speed device port	One USB 2.0 hi-speed device port on rear panel
LAN port	10/100Base-T (requires DSOXLAN module)
Video out port	Connect oscilloscope display to an external monitor or projector (requires DSOXLAN module)
GPIB port	To allow easy migration into existing test systems (requires DSOXGPIB)
Probe compensator output	Square wave: 2.5 Vpp, 1 kHz
Kensington style lock	Rear-panel security slot connects to standard Kensington-style lock
WaveGen out	Front-Panel BNC Connector

Performance characteristics

WaveGen – Built-in function generator	
Waveforms	Sine, square, pulse, triangle, ramp, noise, DC
Sine	• Frequency range: 0.1 Hz to 20 MHz • Amplitude flatness: ±0.5 dB (relative to 1 kHz) • Harmonic distortion: –40 dBc • Spurious (non harmonics): –40 dBc • Total harmonic distortion: 1% • SNR (50 ohm load, 500 MHz BW) : 40 dB (Vpp > = 0.1 V); 30 dB (Vpp < 0.1V)
Square wave /pulse	• Frequency range: 0.1 Hz to 10 MHz • Duty cycle: 20 to 80% • Duty cycle resolution: Larger of 1% or 10 ns • Pulse width: 20 ns minimum • Rise/fall time: 18 ns (10 to 90%) • Pulse width resolution: 10 ns or 5 digits, whichever is larger • Overshoot: < 2% • Asymmetry (at 50% DC): ±1% ± 5 ns • Jitter (TIE RMS): 500 ps
Ramp/triangle wave	• Frequency range: 0.1 Hz to 100 kHz • Linearity: 1% • Variable symmetry: 0 to 100% • Symmetry resolution: 1%
Noise	Bandwidth: 20 MHz typical
Frequency	• Sine wave and ramp accuracy: ◦ 130 ppm (frequency < 10 kHz) ◦ 50 ppm (frequency > 10 kHz) • Square wave and pulse accuracy: ◦ [50+frequency/200] ppm (frequency < 25 kHz) ◦ 50 ppm (frequency ≥ 25 kHz) • Resolution: 0.1 Hz or 4 digits, whichever is larger
Amplitude	• Range: ◦ 20 mVpp to 5 Vpp into Hi-Z ◦ 10 mVpp to 2.5 Vpp into 50 ohms • Resolution: 100 µV or 3 digits, whichever is higher • Accuracy: 2% (frequency = 1 kHz)
DC offset	• Range: ◦ ±2.5 V into Hi-Z ◦ ±1.25 V into 50 ohms • Resolution: 100 µV or 3 digits, whichever is higher • Accuracy: ±1.5% of offset setting ±1.5% of amplitude ±1 mV
Trigger output	Trigger output available on Trig out BNC

InfiniiVision X-Series physical characteristics

Instrument		
Dimensions	mm	Inches
Width	380.6	14.98
Height	204.4	8.05
Depth	141.5	5.57
Weight	kg	lb
Instrument only	3.85	8.5
With accessories	4.08	9.0
Instrument shipping – package dimensions	mm	Inches
Width	450	17.7
Height	250	9.84
Depth	360	14.17
Rack mount	mm	Inches
Width	481.6	18.961
Height	221.5	8.72
Depth	189.34	7.454

Environmental	
Characteristic	
Temperature	Operating: 0 to +55 °C Nonoperating: -40 to +71 °C
Humidity	Operating: Up to 80% RH at or below +40 °C; up to 45% RH up to +50 °C Non-operating: Up to 95% RH up to 40 °C; up to 45% RH up to 50 °C
Altitude	Operating and non-operating: up to 4,000 m
Electromagnetic compatibility	Meets EMC Directive (2004/108/EC), meets or exceeds IEC 61326-1:2005/EN 61326-1:2006 Group 1 Class A requirement CISPR 11/EN 55011 IEC 61000-4-2/EN 61000-4-2 IEC 61000-4-3/EN 61000-4-3 IEC 61000-4-4/EN 61000-4-4 IEC 61000-4-5/EN 61000-4-5 IEC 61000-4-6/EN 61000-4-6 IEC 61000-4-11/EN 61000-4-11 Canada: ICES-001:2004 Australia/New Zealand: AS/NZS
Safety	UL61010-1 2nd edition, CAN/CSA22.2 No. 61010-1-04
Vibration	Meets IEC60068-2-6 and MIL-PRF-28800; class 3 random
Shock	Meets IEC 60068-2-27 and MIL-PRF-28800; class 3 random;(operating 30g, ½ sine. 11 ms duration, 3 shocks/axis along major axis, total of 18 shocks

InfiniiVision X-Series physical characteristics

Connectivity	
Standard ports	One USB 2.0 high-speed device port on rear panel Two USB 2.0 high-speed host ports, front and rear panel Supports memory devices and printers
Optional ports	GPIB, LAN, VGA

Nonvolatile storage	
Reference waveform display	2 internal waveforms or USB thumb drive
Waveform storage	Setup, .bmp, .png, .csv, ASCII, XY, reference waveforms .alb, .bin, lister, mask
Max USB flash drive size	Supports industry standard flash drives
Set ups without USB flash drive	10 internal setups
Set ups with USB flash drive	Limited by size of USB drive

Related literature

Publication tetle	Publication type	Publication number
Serial Bus Applications for Agilent InfiniiVision 3000 X-Series Oscilloscopes	Data sheet	5990-6677EN